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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/768,896	01/30/2004	Toshihiko Tsuji	1232-5268	7295
27123	7590	09/22/2005	EXAMINER	
MORGAN & FINNEGAN, L.L.P.			NELSON, VIVIAN HSU	
3 WORLD FINANCIAL CENTER			ART UNIT	PAPER NUMBER
NEW YORK, NY 10281-2101			2851	

DATE MAILED: 09/22/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 10/768,896	<b>Applicant(s)</b> TSUJI, TOSHIHIKO 	
	<b>Examiner</b> Vivian Nelson	<b>Art Unit</b> 2851	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-18 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 30 January 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |  |
|--|--|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. ____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)            |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date ____ | 6) <input type="checkbox"/> Other: ____  |

## **DETAILED ACTION**

### ***Drawings***

Figures 3-6 and 11-14 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the examiner does not accept the changes, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

### ***Specification***

The disclosure is objected to because of the following informalities:

- On page 16 line 4, "parallel EUV light" is assigned the incorrect reference number (with respect to the drawing).
- The term "projection optical system" is assigned two different reference numbers (i.e. 18 and 1008 on pages 2, 3, 21, etc.) with respect to different figures in the disclosure. Both refer to set of mirrors, which make up the projection optical system – which one is it?
- An "arc illuminated area" and "arc slit opening" on page 23 lines 25-26 have the same reference number.
- A "reflection mask 16" on page 25 line 9 is not labeled in the drawings.

- On pages 26 and 27 lines 27 and 2, respectively, the “optical axis” designated as “18X” is not shown.

Appropriate correction is required.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1, 3, 11-14, and 16-18 are rejected under 35 U.S.C. 102(e) as being unpatentable by Terasawa (patent # 6,860,610).

1. Terasawa teaches (claim 1) an illumination optical system for illuminating a reflection mask 1007 with light from a light source 1013, which also includes:

a field stop 13 opening that defines an illuminated area on the reflection mask 1007 (column 6 lines 33-34);

a coaxial optical imaging system for directing the light from the field stop 13 opening into the reflection mask 1007 (col. 2 lines 43-44);

a projection optical system 18 for projecting the reflection mask pattern onto a substrate 19, where the principal ray of the imaging system at a side of the reflection mask forms an inclination angle to a common axis of the coaxial optical system, so that the inclination angle is approximately equal to an angle between a principal ray of the projection optical system at the

side of the reflection mask and normal to the surface of the reflection mask (col. 8 lines 36-37 and col. 9 lines 1-2, Fig. 1).

A field stop is defined as being an “aperture situated at a focal plane of the optical system that determines the boundaries of the field of view, limits image size, and prevents rays of poor imaging quality from advancing to the image plane”. Similarly, an aperture stop is a “mechanical opening that physically limits the diameter of light bundle that will pass into or through the lens of the optical system”. In this case, the two terms are equivalent.

2. Terasawa anticipates having the principal ray of the imaging system at a side of the field stop being approximately parallel to the common axis (claim 3) in col. 8 lines 36-37 and col. 9 lines 1-2.

3. An imaging system with four mirrors as described in claim 11 is outlined by Terasawa in col. 2 lines 43-45. Further, the first, second and fourth mirrors are concave (claims 12 and 14 – col. 5 lines 12-13 and lines 26-27, respectively), while the third mirror is convex (claim 13 – col. 5 lines 20-21).

4. Terasawa’s invention also uses ultraviolet of 200 nm or smaller and extreme ultraviolet light between 5 nm and 20 nm (claims 16 and 17) – see col. 3 lines 7-9.

5. The method of fabricating in Terasawa’s disclosure is also the same (claim 18):

exposing an object using an exposure apparatus (Fig. 6, step 16);

developing the exposed object (Fig. 6, step 17), where the exposure apparatus includes the system elements of claim 1 (see above).

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 4-10 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Terasawa in view of Tsuji (pre-grant publication #2003/0031017).

6. Terasawa teaches an aperture stop (see above) but does not have a pupil surface in the imaging system (claim 4) that includes a mirror with its reflective surface at the pupil surface (claim 15). Tsuji shows a pupil plane position in paragraph 0133 and in Fig. 15 as being both in the imaging system and with a reflective surface at the pupil surface. It would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate a pupil surface within the imaging system to acquire different shaped (e.g. ring-like or turret) illuminated distributions.

7. As anticipated by Terasawa, (claim 5) the aperture stop is an opening that can physically limit the diameter (size) of the light passing through it (col. 6 lines 33-34); however, Terasawa lacks a mechanism in the illumination optical system for changing the shape of the aperture opening. Tsuji teaches a deformed illumination procedure that involves switching the patterns over the opening of a stop (paragraph 0129 and Fig. 14). It would have been obvious to one of ordinary skill in the art at the time of the invention to use this deformed illumination method for ultra resolution technology, or Resolution Enhanced Technology (RET).

8. Terasawa outlines the use of an aperture stop (see above) but does not include a masking blade with light-shielding plates or an arc slit when an arc opening (claims 6, 7, and 9). Tsuji, on the other hand, does describe a masking blade made of EUV light absorbing material and an arc-

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shaped opening (par. 0103-0104). It would have been obvious to one of ordinary skill in the art at the time of the invention to include this masking blade to block unwanted light from the arc slit and thereby improving efficiency and luminance uniformity.

9. An integrator is used to uniformly illuminate a particular object within an illumination optical system. As shown in col. 9 lines 55-60, Terasawa outlines (for claim 10) a reflection integrator that forms plural secondary light sources using the light from the light source (“radiated approximately isotropically”); and a mirror system for superimposing light from the plural secondary light sources on the field stop. Terasawa does not show the mirror system forming the arc illuminated area, where the arc illuminated area has a curvature center on the common axis (claim 8). In paragraphs 0085-0086 (and Figs. 2, 4a, 7 and 19), Tsuji describes how the mirror system creates an arc illuminated area from the cylindrical surfaces so that the mask surface can be uniformly illuminated; the curvature center would have to be on the common axis in order to achieve uniformity. So it would have been obvious to one of ordinary skill in the art at the time of the invention to use a reflective optical integrator to more effectively and uniformly illuminate the arc region.

Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Terasawa in view of Sato (pre-grant publication # 2003/0142322).

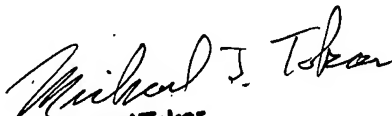
10. As before, Terasawa teaches the illumination optical system (from claim 1 – see above) but does not include a plane mirror 14e for reflecting light from the imaging system and for introducing light into the reflection mask 16. Sato teaches both the plane mirror and a rotating paraboloidal mirror. It would have been obvious to one of ordinary skill in the art at the time of

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the invention to use either the plane mirror or the rotating paraboloidal mirror in the illumination optical system to take advantage of the various angles at which a light would be reflected from points on the mirror.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

vhn

  
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